NuTool – Boot Loader ISP Tool
User Manual

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1 OVERVIEW

The NuTool – Boot Loader ISP Tool is a tool specially designed for NuMicro MCU series with Boot Loader ISP mode. The NuTool – Boot Loader ISP Tool can connect to Boot Loader of the target chip through various interfaces, such as USB, UART, SPI, I²C and CAN, to update the firmware of APROM and LDROM and modify the CONFIG settings.

The complete Boot Loader In-System-Programming (ISP) process consists of the NuTool – Boot Loader ISP Tool, the connection interface, and Boot Loader of the target chip.

The block diagram of the Boot Loader ISP process is shown in Figure 1-1.

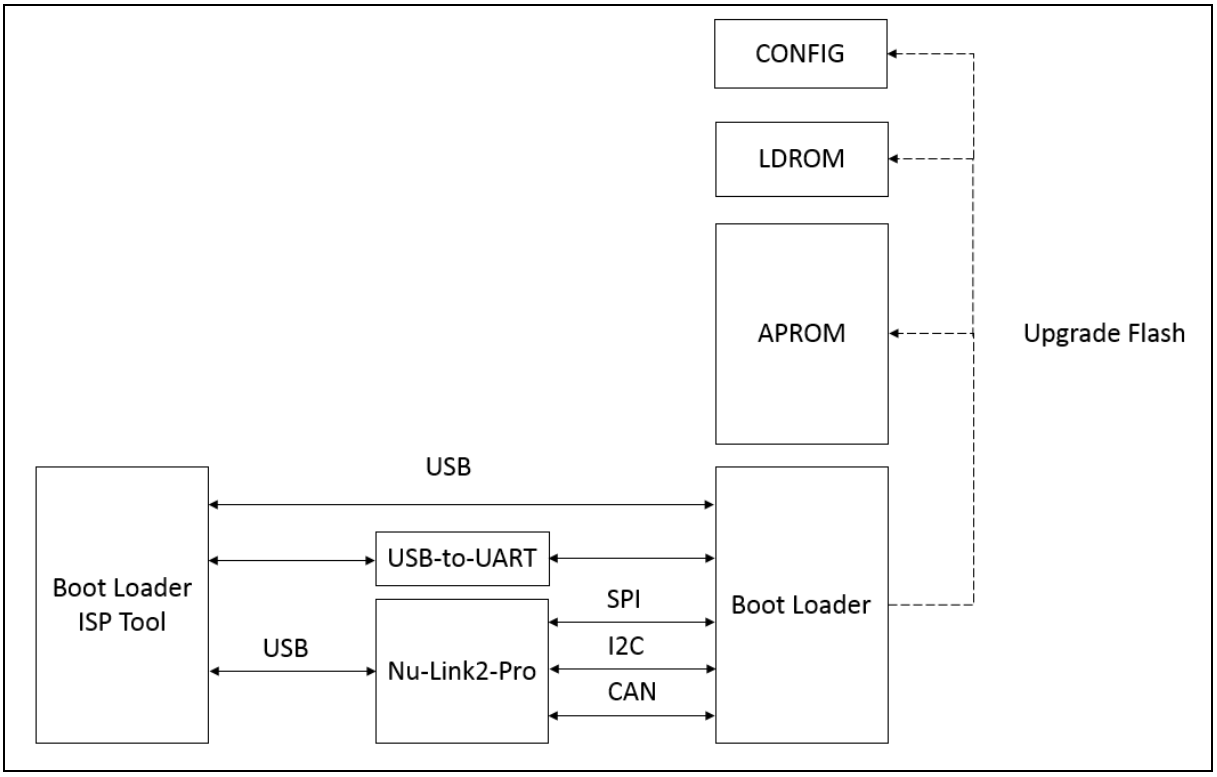


Figure 1-1 Block Diagram of Boot Loader ISP Process

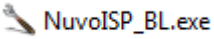
2 FEATURES

The NuTool – Boot Loader ISP Tool features are listed below:

- Save users time in developing ISP firmware.
- Provide a variety of connection interfaces: USB, UART, SPI, I²C and CAN.

3 SOFTWARE AND HARDWARE REQUIREMENTS

To use the NuTool – Boot Loader ISP Tool, software and hardware requirements are listed below:

- Download *NuvoISP_BL.exe* 

from (https://www.nuvoton.com/resource-download.jsp?tp_GUID=SW132022071806572776).
- Prepare Nu-Link or Nu-Link2 with VCOM function or a USB-to-UART converter if UART ISP mode is selected.
- Prepare Nu-Link2-Pro if SPI, I²C or CAN ISP mode is selected. The three Boot Loader ISP modes require the Nu-Link2-Pro Bridge to convert the commands and data of the NuTool – Boot Loader ISP Tool into corresponding signals respectively, and communicate with the Boot Loader of the target chip. The overview of Nu-Link2-Pro is shown in Figure 3-1.
- Enable the appropriate Boot Loader ISP mode according to the application. Figure 3-3 presents how to use Nuvoton's ICP Programming Tool to set Boot Loader ISP mode of M460 seres.

Note: For more information about Nu-Link2-Pro Bridge, please refer to Chapter 3 in *Nu-Link2-Pro Debugger and Programmer User Manual* (https://www.nuvoton.com/resource-download.jsp?tp_GUID=UG1320200319174043). Figure 3-2 shows the pin definitions of Nu-Link2-Pro Bridge Connector.

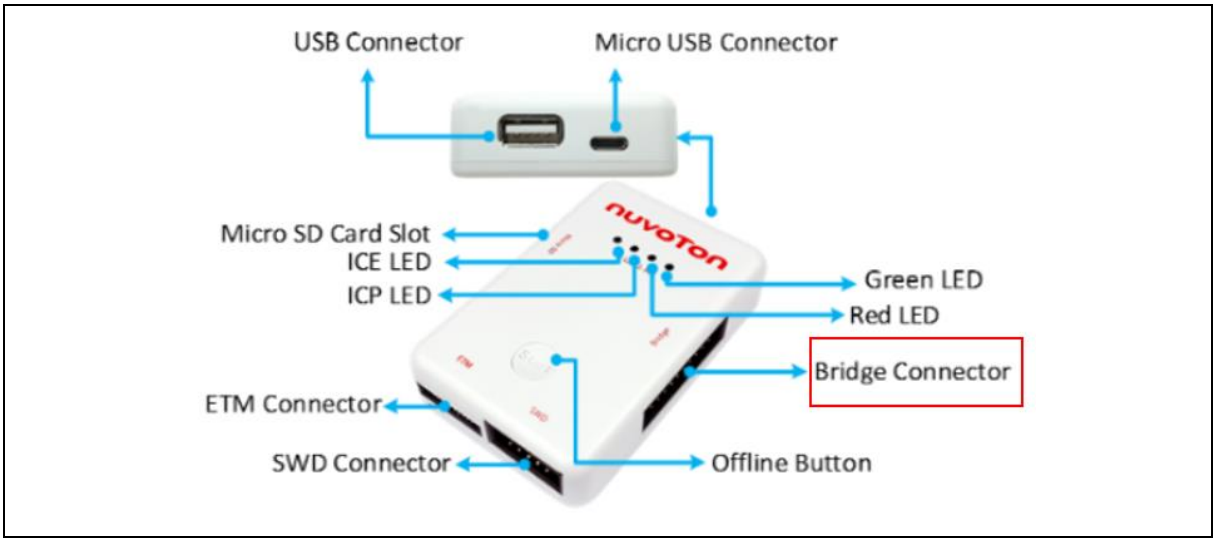


Figure 3-1 Nu-Link2-Pro Overview

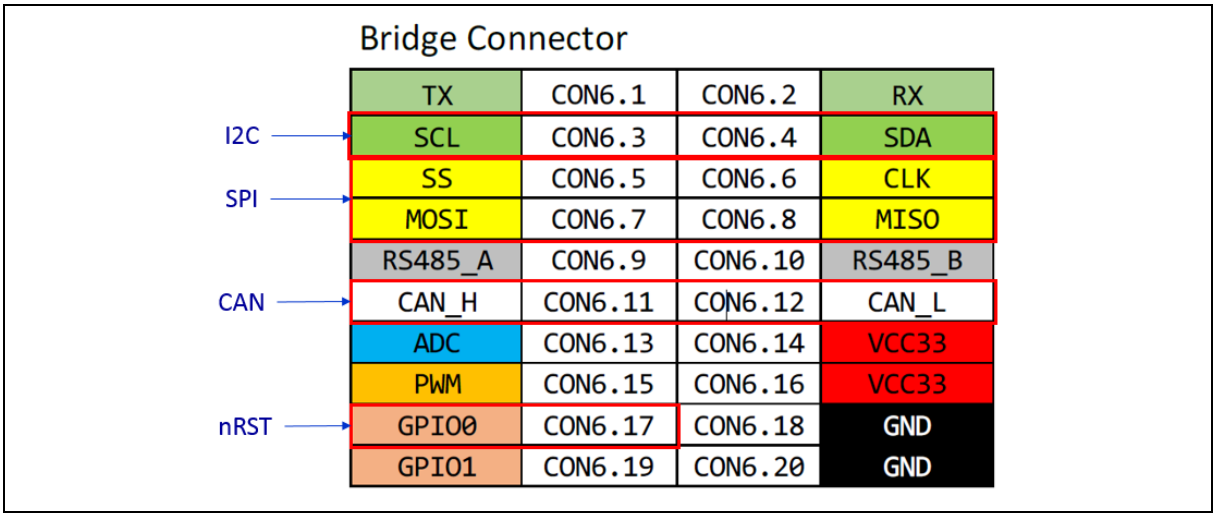


Figure 3-2 Nu-Link2-Pro Bridge Connector

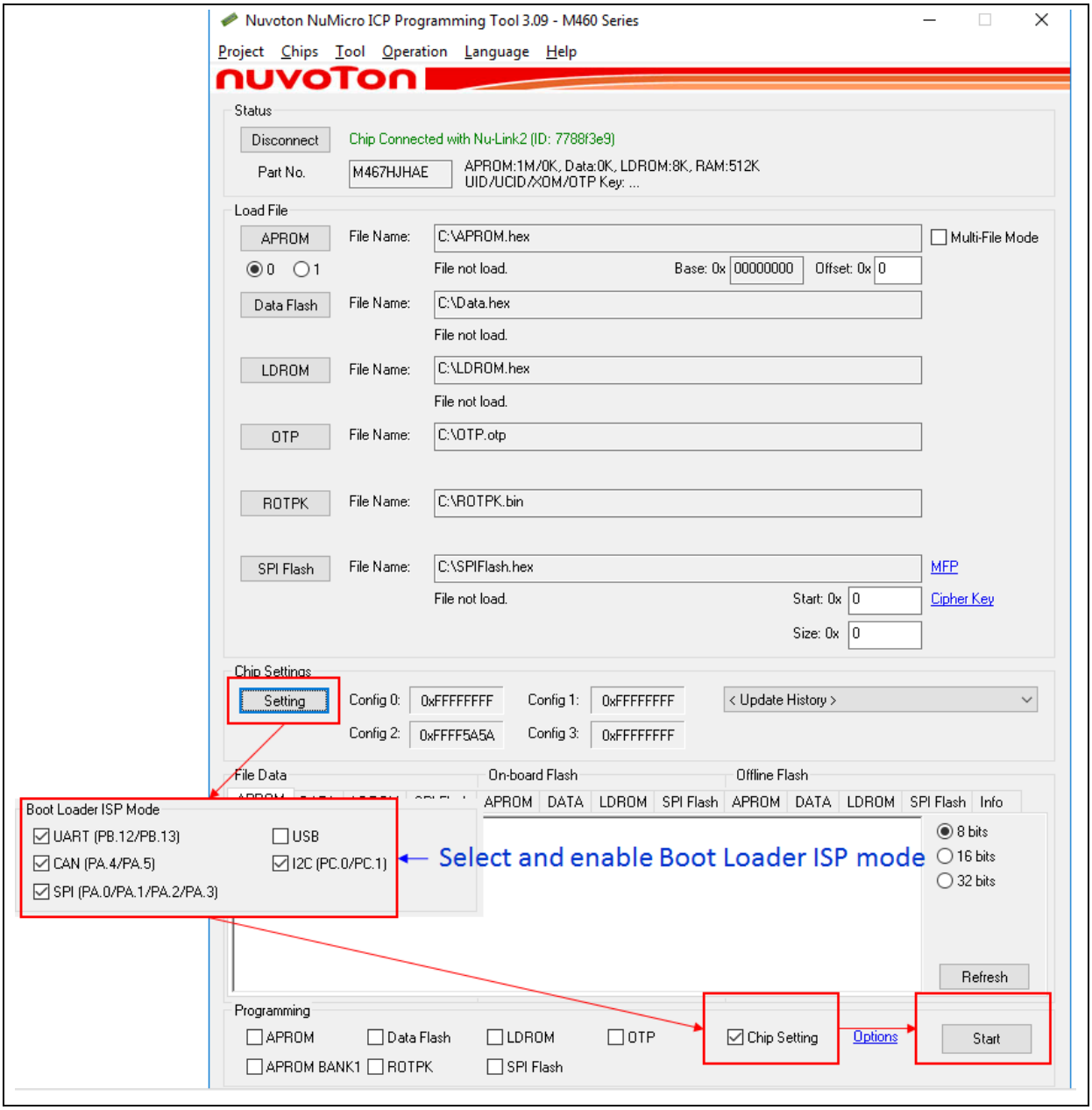


Figure 3-3 Set Boot Loader ISP Mode

4 USER INTERFACE GUIDE

4.1 Overview

When *NuvoISP_BL.exe* is executed, the NuTool – Boot Loader ISP Tool window will pop up, mainly including the Connection Interface selection, connection and chip information display, file loading, CONFIG settings, reset options and progamminmg options. The overview of the NuTool – Boot Loader ISP Tool is shown in Figure 4-1.

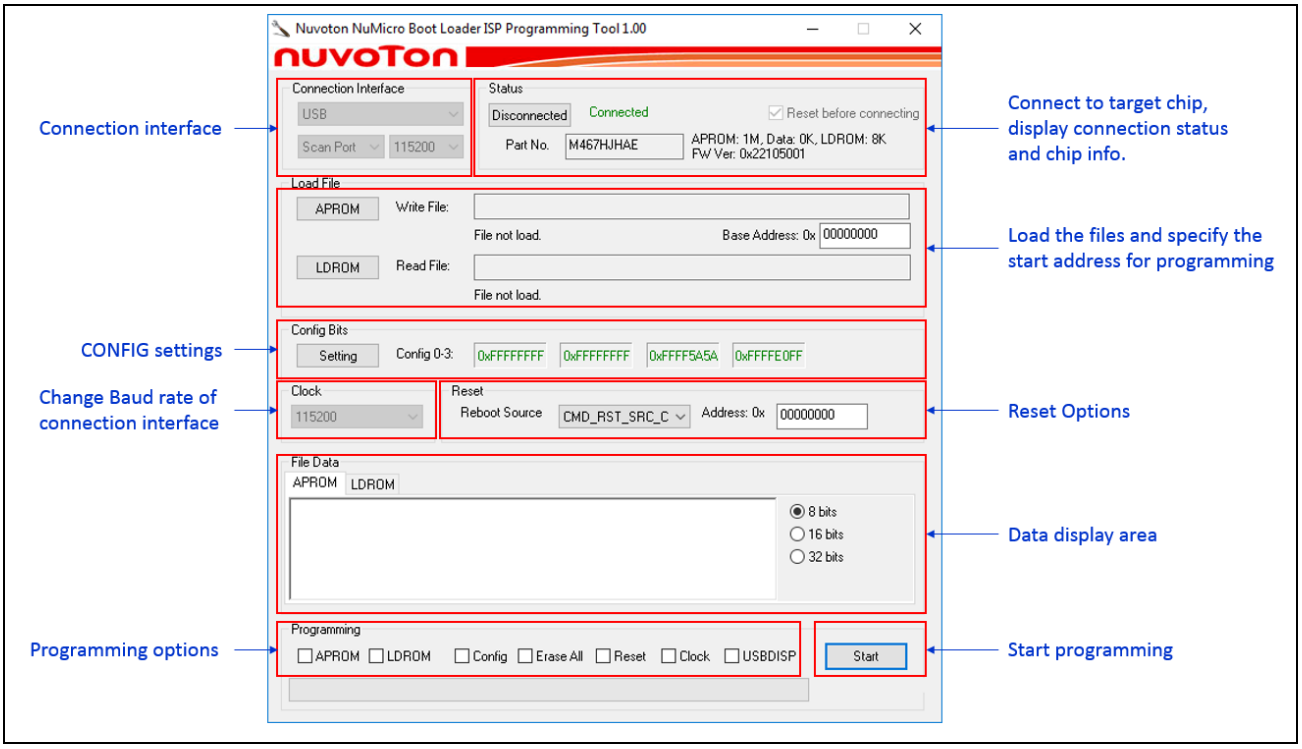


Figure 4-1 NuTool – Boot Loader ISP Tool Overview

4.2 Select Connection Interface

Before updating the target chip, the NuTool – Boot Loader ISP Tool needs to connect with Boot Loader first. There are five connection interfaces including USB, UART, SPI, I²C and CAN for users to select, as shown in Figure 4-2. Users can select the appropriate connection interface according to the actual product circuit.

Note: The three interfaces of SPI, I²C or CAN need to use with Nu-Link2-Pro Bridge function.

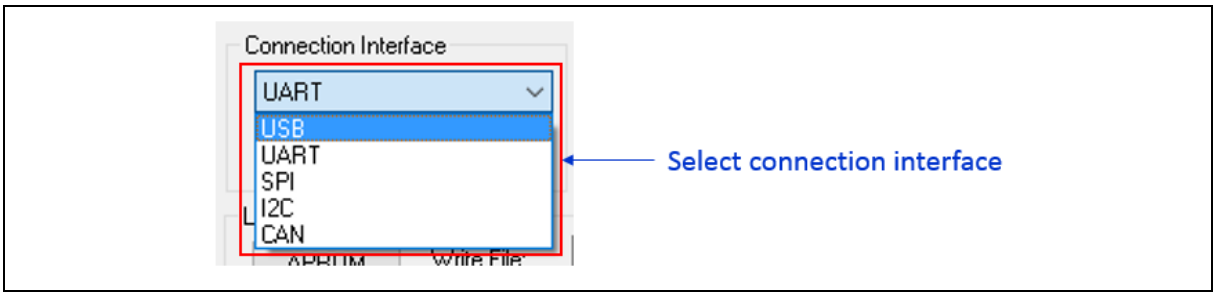


Figure 4-2 Connection Interfaces

4.2.1 USB Interface

If USB is selected as the connection interface, confirm whether the USB ISP mode is enabled. Then just connect the USB port of the target chip to the PC without any wiring.

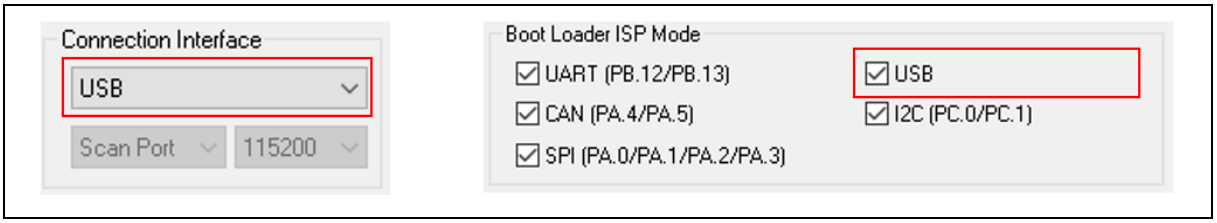


Figure 4-3 USB Interface

4.2.2 UART Interface

If UART is selected as the connection interface, confirm whether the UART ISP mode is enabled. Then the user can use the Nu-Link/Nu-Link2 VCOM function or the USB-to-UART converter on the market to connect with the UART interface of the target chip. The Nu-Link/Nu-Link2 VCOM or the USB-to-UART converter must connected to the pins specified by Boot Loader. Taking the M460 series as an example, the pins of UART interface are PB.12 and PB.13. Finally, select the appropriate COM port and baud rate to connect.

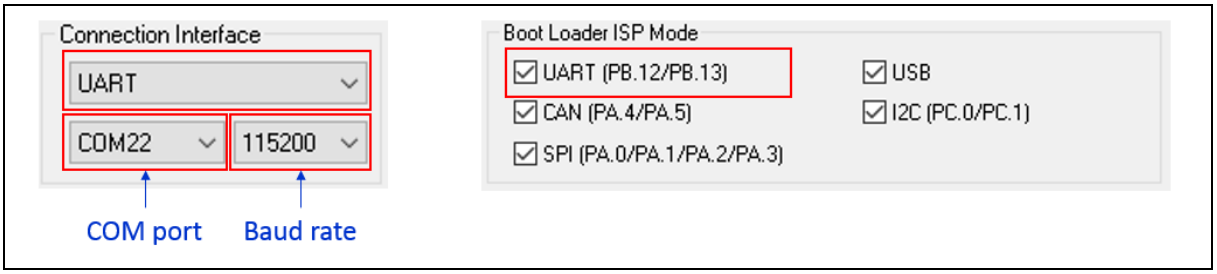


Figure 4-4 UART Interface

4.2.3 SPI Interface

If SPI is selected as the connection interface, confirm whether the SPI ISP mode is enabled. Then the user needs to connect the SPI interface (CON6.5~CON6.8) of Nu-Link2-Pro Bridge as shown in Figure 3-2 to the pins of the SPI interface specified by Boot Loader. Taking the M460 series as an example, the pins of SPI interface are PA.0, PA.1, PA.2 and PA.3.

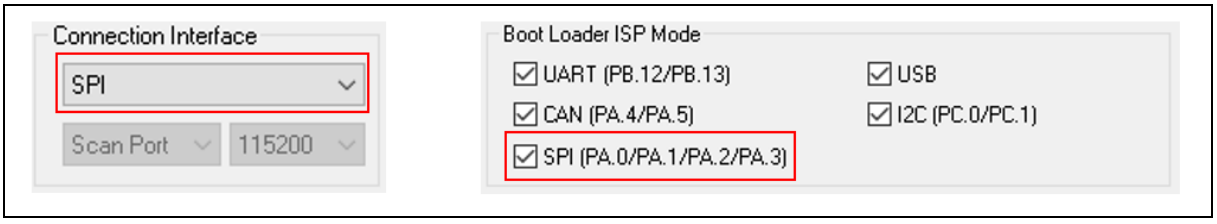


Figure 4-5 SPI Interface

4.2.4 I²C Interface

If I²C is selected as the connection interface, please confirm whether the I²C ISP mode is enabled. Then the user needs to connect the I²C interface (CON6.3 and CON6.4) of Nu-Link2-Pro Bridge (as shown in Figure 3-2) to the pins of the I²C interface specified by Boot Loader. Taking the M460 series as an example, the pins of I²C interface are PC.0 and PC.1.

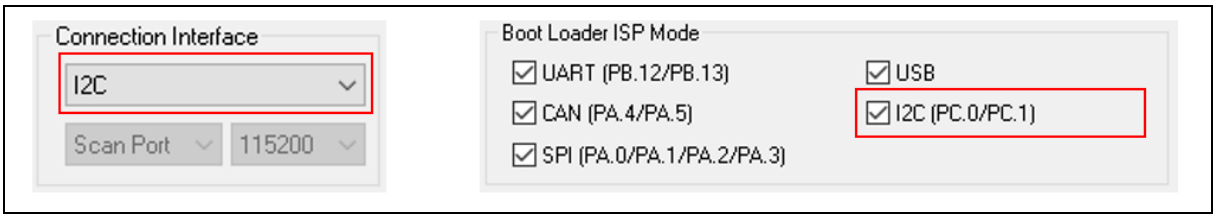


Figure 4-6 I²C interface

4.2.5 CAN Interface

If CAN is selected as the connection interface, please confirm whether the CAN ISP mode is enabled. Then the user needs to connect the CAN interface (CON6.11 and CON6.12) of Nu-Link2-Pro Bridge (as shown in Figure 3-2) to the CAN transceiver on the board of target chip. And the pins of the CAN interface specified by Boot Loader must also be connected to the CAN transceiver. Taking the M460 series as an example, the pins of CAN interface are PA.4 and PA.5.

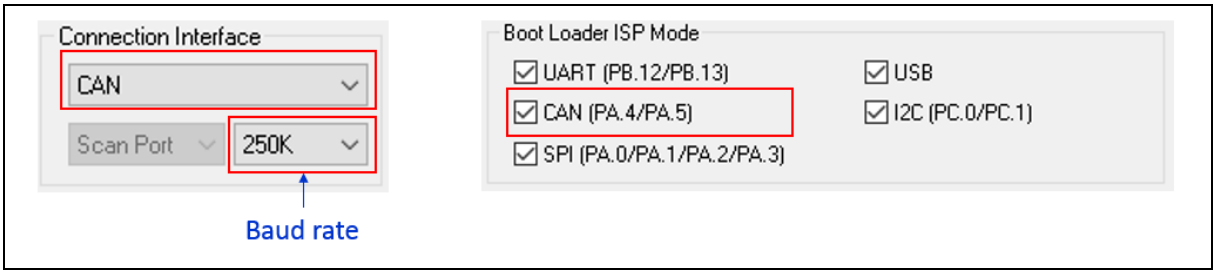


Figure 4-7 CAN Interface

4.3 Connect with Boot Loader

Since Boot Loader has a time-out mechanism, the connection must be completed within a specified time after the chip is powered on. Thus, the user must click the "**Connect**" button first, and then press the reset button on the target chip board. Please repeat the previous steps if it is still failed to connect after waiting for a while.

In the following cases, the user can check the "**Reset before connecting**" option as shown in Figure 4-8 to improve the connection success rate.

- UART is selected as the connection interface, and Nu-Link/Nu-Link2 VCOM is used as the bridge.
- SPI, I²C or CAN is selected as the connection interface, and GPIO0 (CON6.17) of Nu-Link2-Pro Bridge as shown in Figure 3-2 is connected to nRST pin of the target chip.

If the connection is successful, the status prompt will change to "connected" and display the Part No., Flash memory size and firmware version of the Boot Loader as shown in Figure 4-9; otherwise, the status prompt keeps showing "Waiting for device connection", as shown in Figure 4-10.

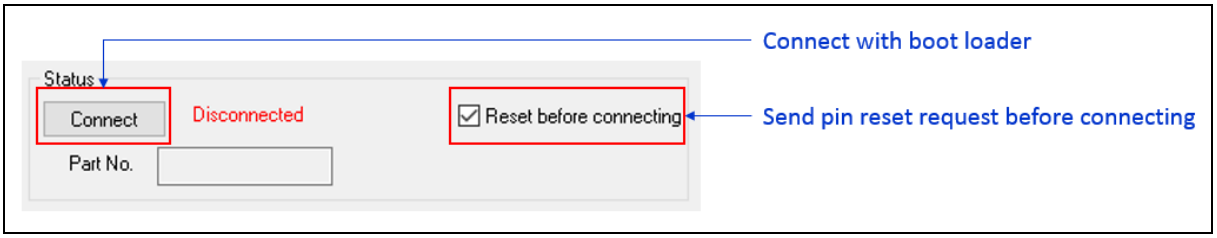


Figure 4-8 Start Connecting

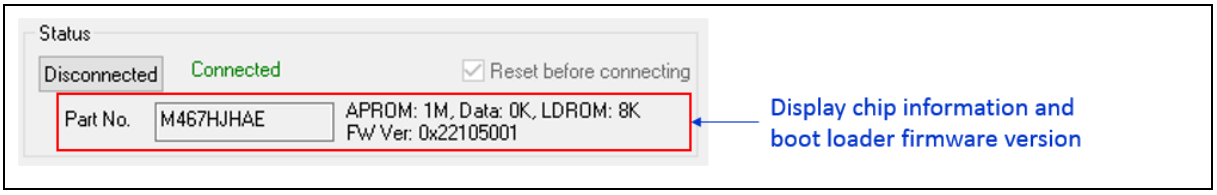


Figure 4-9 Succeed to Connect with Boot Loader

Figure 4-10 Waiting to Connect with Boot Loader

4.4 Load File

Users can click the "**APROM**" and "**LDROM**" button or drag and drop to load the image file, and then specify the starting address of APROM programming. When the image file is loaded, the image data is displayed in the corresponding data display area (as shown in Figure 4-12).

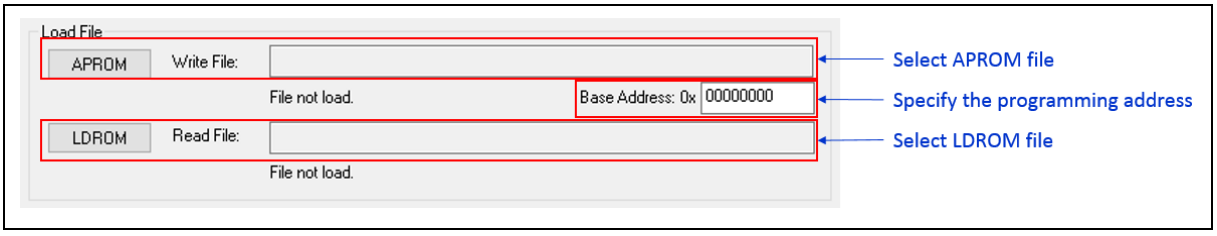


Figure 4-11 Load File

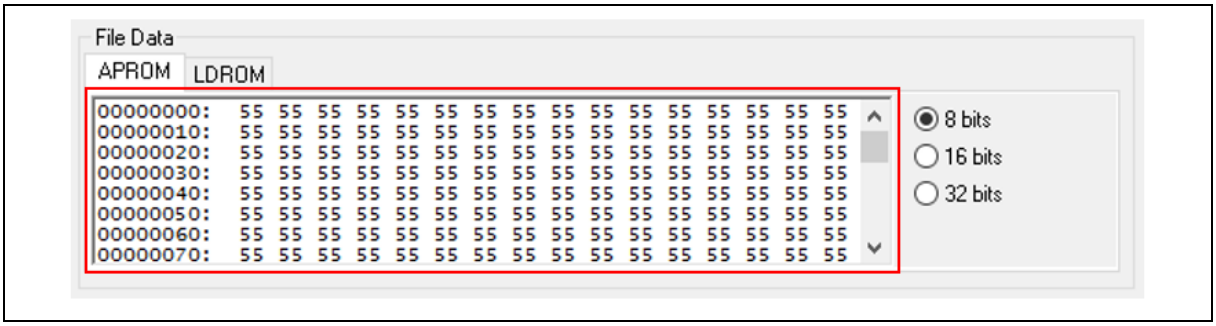


Figure 4-12 Data Display Area

4.5 CONFIG Settings

When the NuTool – Boot Loader ISP Tool is successfully connected with Boot loader, the CONFIG values of the target chip will be displayed in green as shown in Figure 4-13. The users can click the "**Setting**" button to modify the CONFIG values. After comparison, if the modified CONFIG value is different from the original value, the modified CONFIG value is displayed in red, as shown in Figure 4-14.

Figure 4-13 CONFIG Settings

Figure 4-14 Modified CONFIG Settings

4.6 Change the Baud Rate of Connection Interface

After the NuTool – Boot Loader ISP Tool is connected with Boot loader, the user can change the appropriate baud rate of UART or CAN interface according to the circuit capability to improve the transmission efficiency.

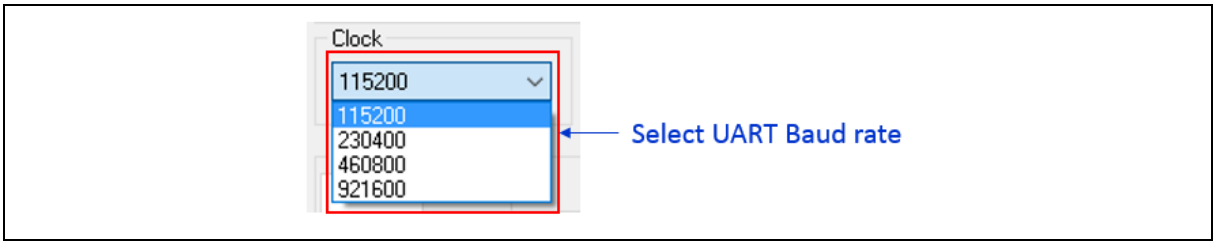


Figure 4-15 Change UART Baud Rate

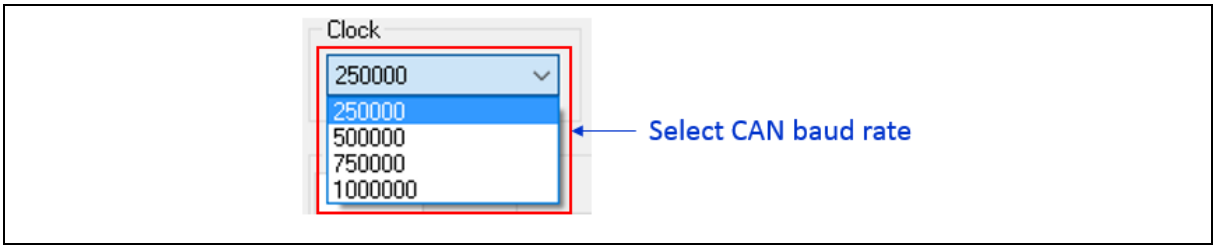


Figure 4-16 Change CAN Baud Rate

4.7 Reset Options

The reset options are used to reset the chip and jump the chip to the specified reboot address. The reset options are executed after updating APROM, LDROM and CONFIG. There are 4 reset sources in the reset options, including:

- **CMD_RST_SRC_CHIP**: Assert the Chip Reset and the reboot address is ignored.
- **CMD_RST_SRC_CPU**: Assert the CPU Reset and reboot from the specified address.
- **CMD_RST_SRC_SYS**: Assert the MCU Reset and reboot from the specified address.
- **CMD_EXEC_ADDR**: Jump to the specified address without reset.

The reboot address must be 512-byte aligned.

For detailed information about Chip Reset, CPU Reset and MCU Reset, please refer to the "System Reset" section in NuMicro Series Technical Reference Manual.

Taking the M460 series as an example, the "System Reset" is described in Section 6.2.2 of the *M460 Series Technical Reference Manual* (https://www.nuvoton.com/resource-download.jsp?tp_GUID=DA05-M460).

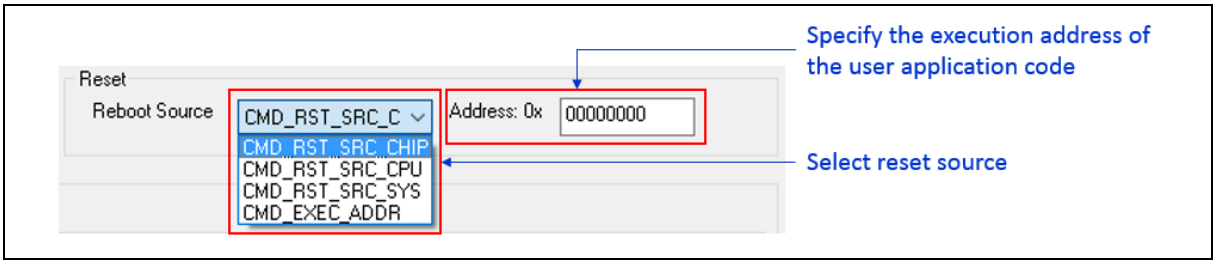


Figure 4-17 Reset Options

4.8 Programming Options

Before programming, the user can check the programming options according to their needs. The programming options include:

- **APROM**: Erase APROM and program APROM file data to the specified APROM address.
- **LDROM**: Erase LDROM and program LDROM file data to LDROM.
- **CONFIG**: Update CONFIG settings.
- **Erae All**: Erase whole APROM and LDROM.
- **Reset**: Execute reset options
- **Clock**: Change baud rate of connect interface. Only UART and CAN have this function.

- **USBDISP**: Switch to Boot Loader USB ISP mode. The premise is that USB ISP mode must be activated.

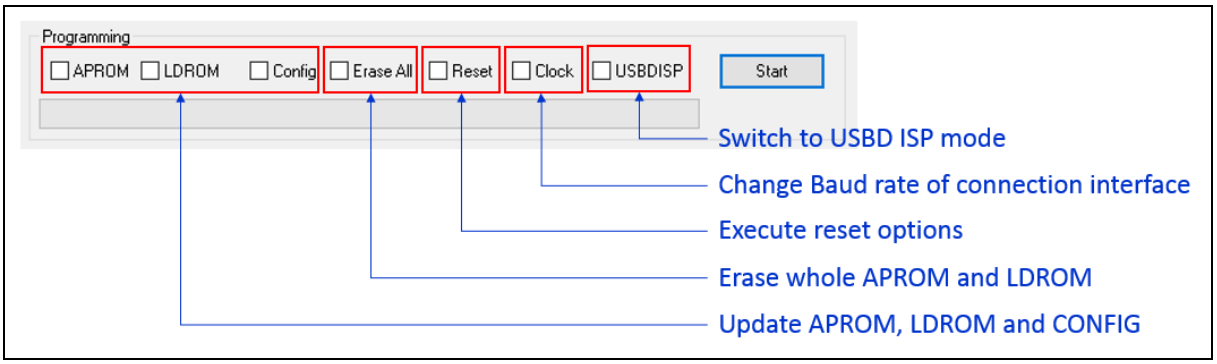


Figure 4-18 Programming Options

4.9 Programming

After loading the files for programming and setting the relevant options, click the "**Start**" button as shown in Figure 4-19 to start programming APROM, LDROM and CONFIG or execute commands of other options. After the programming is finished, a message showing the programming result and time will appear as shown in Figure 4-20.

Figure 4-19 Start Programming

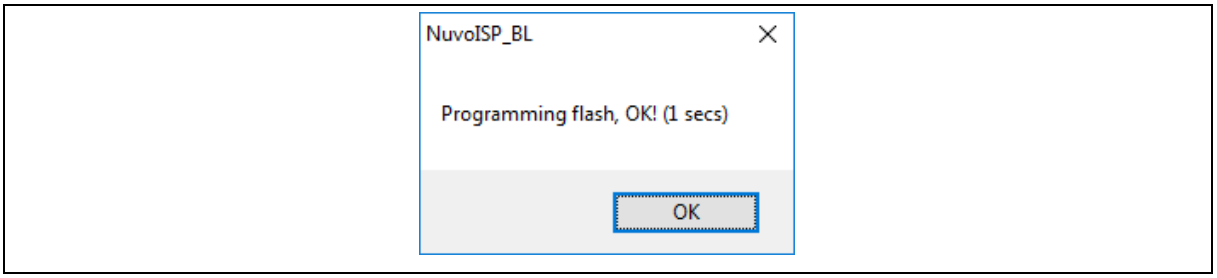


Figure 4-20 Programming Result

5 REVISION HISTORY

Date	Revision	Description
2022.09.21	1.00	Initial version

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